SCENARIO TITLE

Energy Patrol: Make Smart Decisions Based on Environmental Signals

SUBJECT

Environmental Science

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

1. SCENARIO IDENTIFICATION

1.1 Scenario Title

Energy Patrol: Make Smart Decisions Based on Environmental Signals

1.2 Target Age Group

Grades 6–8 (11–14 years)

Curriculum: Lower Secondary School

Thematic Area: Sustainability, Sensor-Based Automation, Digital Literacy

Topics/Subtopics: Responsible Energy Use, Environmental Conditions Monitoring, Human-Technology Interaction, Smart Decision-Making Systems

Expected Learning Outcomes:

By the end of the lesson, Students will be able to:

- Interpret visual/auditory signals from a sensor-based system (FOSSBot)
- Make responsible decisions based on environmental cues
- Relate real-life energy-saving strategies with automated monitoring
- Understand how sensor systems can promote sustainable behaviors
- Work collaboratively to analyze, match, and reason with data provided by a robotic system

1.3 Estimated Duration

90 minutes (2 class periods of 45 minutes)

- **Part 1 (45 minutes):** Introduction to environmental signals, observing FOSSBot outputs, group-based data collection
- **Part 2 (45 minutes):** Matching and decision-making activities, reflection, class discussion

1.4 Subject Areas Involved

Environmental Science , Technology and Engineering , Civic and Social Education

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

1.5 Prerequisite Knowledge

Students should:

- Be familiar with environmental factors such as daylight, visibility, and movement in public spaces
- Understand basic concepts of cause and effect (e.g., "If it's dark and someone is present, lights should turn on")
- Be able to observe and record outputs (such as lights, messages, signals) from a digital device
- Have basic experience in working collaboratively in small groups
- Be comfortable completing structured worksheets with matching and multiple-choice formats

1.6 Purpose of the Scenario

The purpose of this scenario is to raise students' awareness of environmental conditions and responsible energy use by engaging them in interactive tasks facilitated by FOSSBot. At the end of lesson, students will observe robot's responses (such as light activation or screen messages) to real-world stimuli like darkness or movement, and complete classroom tasks accordingly. The scenario promotes critical thinking, environmental literacy, and real-world decision-making skills through a safe, technology-enhanced learning experience.

1.6.1 Learning Objectives/Outcomes

By the end of the scenario, students will be able to:

- Interpret the visual and/or audio signals produced by FOSSBot (e.g., LED light, on-screen messages)
- Match sensor-based outputs with relevant environmental conditions (e.g., darkness, motion detection)
- Make context-based decisions using real-time feedback provided by the robot
- Complete structured tasks (pick-and-drop, matching, multiple choice) based on FOSSBot guidance

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

- Reflect on how automation and sensors can be used for environmental monitoring and energy efficiency
- Collaborate effectively in small groups to observe, discuss, and reason through environmental situations

1.6.2 Teaching Objectives

Through teaching, the educator aims to:

- Guide students in interpreting real-time feedback from a sensor-based robotic system (FOSSBot)
- Promote environmentally responsible thinking through contextual tasks
- Develop students' ability to make informed decisions based on observed data
- Encourage group discussion and collaborative reasoning
- Integrate technology into learning via engaging in coding
- Use interactive and low-tech formats (matching, pick-and-drop, multiple choice) to evaluate comprehension
- Raise awareness about the potential of automated systems in supporting sustainability in daily life

2. LESSON PLAN DEVELOPMENT

2.1 Description of Teaching and Learning Activities

This scenario is designed as an interactive, robot-facilitated learning session where FOSSBot acts as an environmental guide. Students engage in programming while completing structured activities based on FOSSBot's automated responses (e.g., turning on an LED when it's dark and someone approaches).

The scenario begins with a warm-up discussion about why visibility matters in public safety and how environmental conditions affect energy use. The teacher introduces FOSSBot as a "Clean Air Agent" that monitors surroundings using sensors. Students rotate through real-life classroom simulations (light/motion changes) while FOSSBot provides output.

Students interpret those outputs (e.g., "Warning: Low Visibility" or LED activation) and use them to solve guided tasks such as pick-and-drop matching, multiple choice,

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

and reasoning activities. At the end, students reflect on the potential benefits and limits of sensor-based environmental monitoring systems.

A worksheet is used for instruction, guiding students through four (4) consecutive activities:

Activity 1: *Environmental Cues and Robot Observation*

Students are introduced to FOSSBot as an environmental guide. The teacher demonstrates how the robot responds to changes in light and motion using its sensors. Students observe LED behavior and screen messages.

Activity 2: *Pick-and-Drop: Match Signals to Situations*

Students are provided with output messages (e.g., "Low Visibility", "Clear", "Motion Detected") and match them with environmental scenarios presented by FOSSBot in real time.

Activity 3: *Decision Making Based on Sensor Feedback*

FOSSBot is placed in different environmental setups (light/dark, motion/no motion). Students will design their own smart classroom rule using FOSSBot's sensor feedback to support energy efficiency and safety awareness.

Activity 4: *Reflection and Awareness Quiz*

A short metacognitive questionnaire allows students to reflect on what they learned, how they interpreted FOSSBot's cues, and how automation can help communities.

Note: To implement the activities, the FOSSBot must be pre-synchronized with the local Wi-Fi network and pre-programmed with the appropriate automated behavior logic.

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

2.2 Worksheets

Activity 1

In this activity, students are introduced to FOSSBot as an environmental guide. The teacher demonstrates how the robot's sensors detect light and motion changes in the classroom. Students carefully observe the robot's LED responses and screen messages to understand the link between environmental cues and robotic feedback.

1. The teacher activates FOSSBot and explains the purpose of each sensor (light sensor, motion sensor).
2. The teacher dims and brightens the classroom light to show how the LED color changes.
3. The teacher moves an object in front of the robot to demonstrate motion detection.
4. Students observe what happens on the screen display and with the LED indicators and record their observations in the table below.

Environmental Cue	Robot's Sensor Reaction	LED Response	Your Comment
Bright Light			
Darkness			
Sudden Movement in front of Robot			
No movement			

Reflection Questions

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

1. *What did you notice about how the robot "senses" its environment?*

_____

2. *How did the light and motion affect the robot's behavior?*

_____

Activity 2

In this activity, students observe FOSSBot's signals (such as LED color or display messages) that represent different environmental conditions. They match each output message (for example, "Low Visibility," "Clear," "Motion Detected") to the correct environmental situation demonstrated by the teacher.

1. Open the FOSSBot. Wait a few seconds for it to connect to your local network.

2. On a computer or laptop connected to the same network as the robot, open Chrome or Firefox and go to the URL: **http://fossbot-000.local:8081** to access the FOSSBot interface.

3. Upload  the project "**Environmental Signs.xml**".

4. Click **Edit**. 

5. Run  the project.

Answer the question

1. *How do **colors and sounds** help us understand what the robot is sensing?*

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

*H5P will be used, such as https://h5p.org/drag-the-words, and students will **drag the correct FOSSBot signals (LED color or sound)** into the blanks (……).*

The order of the words should be mixed.

Match the FOSSBot signals to the correct environmental situations they represent.

FOSSBot Signal	Environmental Situation
Blue LED – Silent	Darkness / Low visibility
Green LED – Calm tone	Motion detected
Yellow LED – Soft warning tone	No motion / Still environment
Red LED – Alert sound	Bright light

Activity 3

In this activity, FOSSBot acts as a model for how technology can help make classrooms smarter and more sustainable. Students observe how FOSSBot responds to environmental conditions (light, motion) and then design a simple automation rule that could help real classrooms reduce energy waste or increase safety.

1. Run the "Environmental Signs" project one more time.
2. Observe how FOSSBot's sensors react to different environments.

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

3. Think about what each signal could trigger in a smart classroom (for example: turning off lights, closing curtains, or playing a sound alert).

4. Design one clear Smart Classroom Rule using your own words.

5. Explain why your rule is useful for sustainability or safety.

🕵️ *Write your idea below:*

My smart classroom rule is

……

Reason to choose this rule:

This helps our classroom to

……..

Activity 4

H5P will be used, such as https://h5p.org/, and in this activity we aim that students will complete short reflection items about what they observed and understood.

Fill in the blanks with the correct LED color or sound that matches each situation.

Use: red, blue, green, yellow, calm tone, alert sound, soft warning tone, silent

1. When the environment is bright, the LED turns *{green}* and plays a *{calm tone}*.
2. When the room becomes dark, the LED turns *{yellow}* and plays a *{soft warning tone}*.
3. When FOSSBot detects motion, it flashes *{red}* and plays an *{alert sound}*.
4. When no motion is detected, the LED turns *{blue}* and remains *{silent}*.

CC BY NC SA

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

Reflection

How can robots like FOSSBot help people use energy more wisely in their schools or homes?

_____

_____

_____

_____

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein